

BEST AVAILABLE COPY

RECEIVED  
CENTRAL FAX CENTER

JUL 14 2006

AMENDMENTS TO THE CLAIMS

For the Examiner's convenience, all pending Claims are set forth below and have been amended where noted:

1. (Currently Amended) A thermal process for treating a material to improve structural characteristics of the material comprising consisting of:
  - a. placing a material with a material temperature within a thermal control apparatus comprising a chamber with a chamber temperature;
  - b. introducing a cryogenic material into the thermal control apparatus to decrease the material temperature, while preventing over-stressing of the metal, to a first target temperature ranging from -40 -120 degrees F and -380 degrees F at a first temperature rate ranging from 0.25 degrees per minute and 20 degrees per minute;
  - c. stopping the introduction of the cryogenic material into the chamber once the first target temperature is reached for at least two hours;
  - d. increasing heating the material chamber temperature to a second target temperature ranging from 0 degrees F and 1400 degrees F; and
  - e. increasing the material temperature to the second target temperature at using a second temperature rate ranging from 0.25 degrees per minute and 20 degrees per minute, and holding that second target temperature for at least fifteen minutes; and
  - f. repeating the process at least two times, consecutively resulting in a treated material without fractures.
2. (Previously Amended) The thermal process of claim 1, wherein the first temperature rate is different from the second temperature rate to create a desired metallurgical feature in the treated material without fractures, wherein the desired metallurgical feature is

BEST AVAILABLE COPY

selected from the group consisting of malleability, flexibility, ductility, hardness, elasticity, strength, and combinations thereof.

3. (Original) The thermal process of claim 1, wherein the first temperature rate is substantially the same as the second temperature rate.
4. (Previously Amended) The thermal process of claim 1, further comprising the steps of:
  - a. introducing a cryogenic material into the thermal control apparatus to decrease the material temperature, while preventing over-stressing of the metal, to a third target temperature at a third temperature rate, wherein the third target temperature is colder than the first target temperature;
  - b. stopping the introduction of the cryogenic material into the chamber once the third target temperature is reached;
  - c. increasing the chamber temperature to a fourth target temperature; and
  - d. increasing the material temperature to the fourth target temperature at a fourth temperature rate, resulting in the treated material without fractures.
5. (Previously Amended) The thermal process of claim 4, further comprising the steps of:
  - a. introducing a cryogenic material into the thermal control apparatus to decrease the material temperature, while preventing over-stressing of the material, to a fifth target temperature at a fifth temperature rate;
  - b. stopping the introduction of the cryogenic material into the chamber once the fifth target temperature is reached;
  - c. increasing the chamber temperature to a sixth target temperature; and
  - d. increasing the material temperature to the sixth target temperature at a sixth temperature rate, resulting in the treated material without fractures.

BEST AVAILABLE COPY

6. (Original) The thermal process of claim 5, further comprising repeating the steps at least four times.
7. (Previously Amended) The thermal process of claim 1, further comprising the step of permitting the material to soak at the first target temperature for a first period of time.
8. (Cancelled)
9. (Currently Amended) The thermal process of claim 1, further comprising the step of permitting the material to soak at the second target temperature for a second period of time.
10. (Currently Amended) The thermal process of claim 9, wherein the second period of time ranges from 15 minutes to up to 48 hours.
11. (Original) The thermal process of claim 1, wherein the thermal process is repeated to create a second desired metallurgical feature in the treated metal without fractures, wherein the second desired metallurgical feature is selected from the group consisting of malleability, flexibility, ductility, hardness, elasticity, strength, and combinations thereof.
12. (Previously Amended) The thermal process of claim 1, wherein the thermal control apparatus further comprises a heat exchanger disposed in the chamber to provide a cryogenic vapor to a tank.
13. (Original) The thermal process of claim 12, wherein the cryogenic material is released into the heat exchanger thereby absorbing heat from the chamber into the heat exchanger forming a cryogenic vapor that fills the tank.
14. (Original) The thermal process of claim 12, wherein the cryogenic vapor is a member of the group consisting of hydrogen, nitrogen, oxygen, helium, argon, and combinations thereof.
15. (Previously Amended) The thermal process of claim 1, wherein the first temperature rate and the second temperature rate are determined by the mass of the material.

BEST AVAILABLE COPY

16. (Previously Amended) The thermal process of claim 4, wherein the third temperature rate and the fourth temperature rate are determined by the mass of the material.
17. (Previously Amended) The thermal process of claim 5, wherein the fifth temperature rate and the sixth temperature rate are determined by the mass of the material.
18. (Original) The thermal process of the claim 1, wherein the chamber is selected from the group consisting of a double-walled insulated chamber, a vacuum chamber, and a vacuum-insulated chamber.
19. (Withdrawn – Currently Amended) The thermal process of claim 1, wherein the material is selected from the group consisting of a bronze, a cobalt, a silver, a silver alloy, a nickel, a nickel alloy, a chromium, a chromium alloy, a vanadium, a vanadium alloy, a tungsten, a tungsten alloy, a titanium, a titanium alloy, a scandium, a scandium alloy, a tin, a platinum, a palladium, a gold, a gold alloy, a plated metal, a lead, a plutonium, an uranium, a zinc, an iron, an iron alloy, a magnesium, a magnesium alloy, a gallium, a gallium arsenide, a selenium, silicon, calcium, calcium fluoride, fused silica materials, germanium, indium, indium phosphide, phosphorous and combinations thereof.
20. (Withdrawn – Currently Amended) The thermal process of claim 1, wherein the material is a laminate.
21. (Withdrawn – Currently Amended) The thermal process of claim 20, wherein the laminate is disposed on a member of the group consisting of a ceramic, a wood, a polymer, and combinations thereof.
22. (Previously Amended) The thermal process of claim 1, wherein the material is a cermet.
23. (Withdrawn – Currently Amended) The thermal process of claim 4, wherein the material is a metal carbide.

Applicant believes that no new matter has been added with these amendments.